

AN UNTRIED METHOD OF DETERMINING THE REFRACTION CONSTANT.—In No. 8, vol. xiii., of *Popular Astronomy*, Mr. Geo. A. Hill, of Washington, describes a new and, as he believes, an untried method for determining the constant of refraction.

Briefly, the method consists in observing the times at which two stars, separated by about twelve hours in right ascension, and both of nearly the same declination, transit across a horizontal wire in the *prime vertical*. In each case the refraction decreases the hour angle, and the arithmetical sum of the hour angles of the two stars will differ from the difference between their right ascensions by twice the refraction, expressed in time, at the zenith distance at which they were observed.

To make this observation Mr. Hill proposes the employment of an instrument similar in form and in the rigidity of its parts to the modern zenith telescope. The telescope is to be established in the *prime vertical*, and mounted so that it is capable of rotation about a rigid vertical axis. Two stops fixed to the base of the instrument would ensure that when the telescope was rotated in azimuth about the vertical axis its line of collimation would still be in the *prime vertical*. Obviously the ideal position for the making of the observations would be at or near to the earth's equator. Many other details of the proposed plan of observations are given at length in Mr. Hill's paper.

SPECTRA OF BRIGHT SOUTHERN STARS.—An appendix to vol. xxviii. of the *Annals*—the volume in which appeared the "Catalogue of the Spectra of Bright Southern Stars"—has just been published by the Harvard College Observatory. It contains two tables, in the first of which there are given the particulars of sixty-nine stars which were accidentally omitted from Table I. in the original volume, and in the second the corrected classification of the spectra of thirty stars which were previously wrongly described.

A CATALOGUE OF 4280 STARS.—No. 15 of the *Publications of the Cincinnati Observatory* is devoted to a catalogue of the positions and precessional constants of 4280 of the stars given in Piazzi's catalogue.

All the stars given by Piazzi that were north of the equator in 1800, except those included in the Berlin "Jahrbuch" and eighteen of the Pleiades group, are included in the catalogue, and the Piazzi number, the position for 1900, the precession, the proper name, and the magnitude are given for each. An appendix contains the proper motions of 35 stars which were placed on the observing list, mostly taken from the Cambridge A.G. Catalogue.

### HIGHER EDUCATION AT THE CAPE.

HIGHER education in Cape Colony is at the present time in a very interesting and perhaps critical condition. It is indeed characteristic of the tardiness of progress in that colony (the eternal motto is "Wacht een beetje") that the crisis should not have arrived until nearly eighty years after the foundation of the first institution designed to promote advanced studies—the South African College in Cape Town. The causes of this retardation are to be found partly in dissipation of effort, partly in the mischievous influence of an iron system of external examinations. The South African College was started on a small scale in 1829 through the liberality of a number of citizens of Cape Town, who became "shareholders" in the venture; but though after a few years it was recognised as a public institution and received support from the public treasury, it did not at first develop with much rapidity; and in 1849 Bishop Gray, after an unsuccessful attempt to buy out the majority of the "shareholders," founded the Diocesan College as a rival institution in the suburbs, thus inaugurating the unhappy policy of multiplying colleges from which the colony still suffers. Four years later Sir George Grey's administration instituted a public board of examiners with power to grant certificates in various subjects, another fateful step, for from that board there sprang in 1873 the University of the Cape of Good Hope, the only body in South Africa which has the right to confer degrees. The character of this so-called university deserves notice. It was modelled on the old University of London, the example of which it follows only too faithfully. It is managed by a council, half the

members of which are appointed by Government, the other half elected by the convocation of graduates. It exercises the two functions of examining and granting degrees, but it does not teach. So abhorrent to it, indeed, is any connection with teaching that it does not allow teachers of candidates to take part in the examinations, a most deleterious prohibition, since in many subjects the only experts belong to the staffs of the colleges. Dissatisfaction with this examining university is the chief cause of the present crisis. Meantime the multiplication of colleges and the wasteful reiteration of similar work in a number of centres has gone on apace. Some of the smaller colleges have, it is true, died out; but there still remain, in addition to the two already mentioned, the Victoria College at Stellenbosch, which was incorporated in 1881, the Huguenot College for Women at Wellington (1898), and the Rhodes University College, which in 1904 took the place of St. Andrew's College at Grahamstown. The western province, therefore, has four colleges, all within forty miles of Cape Town, and the eastern province has one. They are bound hand and foot by the syllabuses and regulations of the university, for the examinations of which they prepare. Alike in strength and in character, however, they vary greatly. The South African College has in recent years developed with wonderful rapidity. It now supports seventeen chairs and has about 260 students, whom it draws in approximately equal numbers from the British and from the Dutch, and in thus bringing the two races together exercises a most beneficial influence, which it rightly regards as one of its chief claims to support. Its arts buildings are old and need reconstruction, but blocks of science buildings have lately been erected which would do credit to any university in the Empire, and the intention is to house the arts also on a similar scale. The only other college approaching it in strength is that of Stellenbosch, which has also developed recently, though it remains somewhat smaller and is less well equipped for the teaching of science. That the two strongest colleges should be in such close proximity is a particularly unfortunate result of the short-sighted policy (or lack of policy) which has been characteristic of the educational administration of the colony in the past. On purely educational grounds this duplication cannot be justified. But it is to be feared that racial rather than properly educational motives have led to the development of a second large college so near to Cape Town, and this may be said without any reflection upon the instruction given at it. For the Victoria College is almost completely under the influence of the neighbouring theological seminary of the Dutch Reformed Church; its students are almost entirely Dutch; it is in sentiment and in popular estimation the Dutch College. Even were the instruction provided the best in the world, it would be still altogether deplorable that this tendency to racial separatism in education should have gained recognition and support. Of the remaining colleges, that at Grahamstown has a fairly large staff, but as yet few students and no buildings, and in view of the backward state of education in the east its position seems a little precarious, but if it can encourage the schools in that part to improve it should prosper. The Diocesan College and the Huguenot College are both small, and probably they will in the end have to unite with their more powerful neighbours.

The education provided by the colleges is not so good as it might be under more favourable conditions. One at least of them, the South African College, is in every way competent to give as advanced instruction as most colonial universities, and equally with them to promote research; but it is hampered at once by the schools below it and by the university above it. In mathematics, indeed, the general standard of the schools is remarkably high; a few schools maintain a fair standard in science as well, but in literary subjects they are all miserably weak. This is partly due to the absence of any proper system of secondary or of intermediate education. The Education Department is frequently accused of an undue affection for red tape, with which it is said to strangle the more advanced and ambitious schools in the interests of weaker country schools, that have to be kept up to the mark by strict regulations. However that may be, there is no advanced secondary education in the colony. The schools do not

carry their classes beyond the matriculation examination of the university, which thus serves as a general leaving examination, and when their pupils have passed it there is nothing for them to do, if they wish to prosecute their studies further, but to go on to college, however young and crude they may be. So long as the present university system endures it is difficult to foresee any remedy for this. The university does not demand of its candidates for the higher examinations that they should have been trained at a college, and were the schools to develop advanced classes they would merely compete with the colleges in teaching for the intermediate degree examination, the standard of which would be still further lowered. What is wanted is a system of secondary schools entirely independent of any university, the pupils of which would not be sent on to college until they had reached a decent maturity. As things are, the whole educational system of the colony is absolutely subject to the tyranny of external examinations, and for this the university is chiefly responsible.

So unsatisfactory a state of affairs cannot endure much longer. The only radical cure for it is one which Mr. Rhodes attempted to bring about years ago, the institution of a single teaching university in Cape Town. (The eastern province is not yet sufficiently developed to support a separate university, but in view of its great distance from Cape Town the college at Grahamstown might perhaps remain as an affiliated institution until it is strong enough to stand alone.) Such a teaching university Mr. Rhodes would have endowed, and even though, through local jealousies, the chance of his munificence has been lost, his plan remains the wisest and even the most economical. The Government is remarkably liberal in the cause of higher education. It pays, usually up to a limit of 200*l.* a year, half the salary of all professorships or lectureships the institution of which it approves; it pays half the expenses of general maintenance, and issues loans in aid of building schemes on very favourable terms. In the case of colleges which confine themselves to work above the standard of matriculation and have not less than seventy-five matriculated students—*i.e.* at present in the case of the South African and Victoria colleges—the grants in aid of salaries may be increased up to a limit of 350*l.* The public expenditure on behalf of higher education is thus very considerable, but it is dissipated among several centres, and the benefits accruing from it are necessarily less than they would be were it directed to the support of a single teaching university.

Unfortunately, this ideal is even more unlikely of achievement now than it was in Mr. Rhodes's lifetime. Public opinion remains inert, but the colleges have grown, and it would be almost impossible, and probably undesirable, to force them into reluctant amalgamation. Yet something must be done. The country colleges would prefer probably the conversion of the present university into a federal system of constituent colleges, a policy which has, of course, been tried elsewhere, but without much success. In Cape Town, on the other hand, the feeling is growing that, even though other centres may stand aloof, the city itself should do its best to realise Mr. Rhodes's purpose by founding a teaching university. In the South African College it has the means of doing so, and when that institution has completed its present scheme of development its just claim to independence could not be refused. Nothing could be more beneficial to the colony than such a university in Cape Town with well staffed and well equipped professional schools attached to it. Not only would it raise the general standard of education, as no merely examining body can, but it would draw together and train together the best intellects among the youth of the country, and would thus prove an invaluable factor in the work of uniting the races. No doubt it is a costly scheme, and since the Government cannot concentrate its support of higher education, but will have to continue to assist some at any rate of the local colleges, a great part of the burden must fall on private benefactors. But at the Cape itself to arouse enthusiasm for a great ideal should not be difficult, and it may even be hoped that among the men of millions "who live at home at ease," and who are at last beginning to appreciate the desert of universities, some may be found willing to assist a scheme which is not the less deserving because it is South African.

## THE BATOKA GORGE OF THE ZAMBESI.<sup>1</sup>

WHEN I undertook to examine the geological structure of the country around the Victoria Falls on behalf of the council of the British Association, it appeared to me that there were two essential matters on which our information was very inadequate. The first was with respect to the origin of the falls themselves and the singular gorge associated with them, and the second as to the course of the great river for 70 or 80 miles below the falls. The opinion of David Livingstone, stated fifty years ago, that the gorge must have been formed by the sudden opening of a zigzag crack in the earth's crust, had been adopted without question by all subsequent travellers, although hardly anything was known of the cañon beyond the immediate vicinity of the falls.

Before I left England last June, however, a timely store of new information was forthcoming that materially lightened my task. In an able article on "The Physical History of the Victoria Falls" (*Geograph. Journ.*, January), Mr. A. J. C. Molyneux, of Bulawayo, produced strong evidence to prove that the majestic waterfall and its concomitants have been slowly developed by the erosive power of the Zambesi itself. With regard to the course of the river below the falls, unpublished information was most courteously placed at my disposal by the authorities of the British South Africa Co., which showed that a distinguished officer of the company, Mr. F. W. Sykes, the District Commissioner at Livingstone, had succeeded three years ago in penetrating the hitherto unknown country bordering its northern bank for some 40 miles to the eastward of the falls. The report on this journey prepared by Mr. Sykes, and the beautiful photographs by which it was illustrated, were sufficient in themselves to explain the ruling features in the physiography of the district, and incidentally afforded further testimony in favour of Mr. Molyneux's conclusions.

During my own examination of the district in July and August last, I had the inestimable advantage of the personal guidance of Mr. Sykes in my traverse of the country on the northern side of the river from Victoria Falls to Wankie's Drift. In this traverse we were accompanied by Colonel Frank Rhodes,<sup>2</sup> and for part of the distance by Lieut. Burgin, in command of a detachment of native police. The journey entailed a devious and somewhat arduous march of about 120 miles across an almost trackless country, consisting mainly of rugged stony ground covered with low trees. Wankie's Drift appears to lie considerably to the eastward of the position assigned to it on existing maps, its distance in an east-south-easterly direction from Victoria Falls being probably not less than 75 miles as the crow flies.

Our route was roughly parallel to the course of the Zambesi, at first south-eastward for about 20 miles (in a direct line), then toward east-north-east for a further 35 miles, until we crossed the Ungwesi or Kalomo River, and finally east-south-eastward for nearly 40 miles, to the river-crossing at Wankie's. The deep impassable chasms into which all the tributary streams are precipitated as they approach the Zambesi, and the extremely rugged character of the much-dissected ground between them, forbade any passage along the brink of the main gorge except for short distances, and our general line of march was therefore taken beyond the heads of the side-chasms, often many miles from the Zambesi itself. At four places, however, before reaching the Ungwesi, we struck southward to the main river; and at three of these we managed by rough scrambling to descend into the bottom of the gorge. Finding in these places that the ancient lavas of the surrounding plateau—the "Batoka Basalts" of Molyneux—were still, as at the Falls, the only rocks exposed in the gorge, we decided, as time was pressing, to continue along

<sup>1</sup> Abstract of "Report on the Batoka Gorge of the Zambesi and the Country between Victoria Falls and the Confluence of the Deka River," brought before the Geological Section of the British Association at Johannesburg on August 29, by G. W. Lamplugh, F.R.S.

<sup>2</sup> The news, which reached me during the homeward voyage, of the untimely death of Colonel Rhodes at Cape Town on September 21 has overshadowed the otherwise delightful memory of this journey. To have known Colonel Rhodes, the most cheery of travelling companions, at all was inevitably to hold him in affectionate regard. His deep and cultured sympathy in all that pertained to the magnificent Falls, and his efforts to maintain their loveliness unimpaired, deserve the grateful remembrance of all interested in Rhodesia.